

**KENYA AGRICULTURAL MARKETING  
AND POLICY ANALYSIS PROJECT**

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**HOW CAN MICRO-LEVEL HOUSEHOLD  
INFORMATION MAKE A DIFFERENCE FOR  
AGRICULTURAL POLICY MAKING?**

**Selected Examples from the KAMPAP Survey of Smallholder Agriculture  
and Non Farm Activities for Selected Districts in Kenya**

by

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# 1. INTRODUCTION

Agriculture forms the foundation of Kenya's economy. However, the information base on agriculture – including basic indicators on farmers' input, production, and marketing behavior, household food consumption patterns, etc. – is weak and largely outdated.

Agricultural policy is largely made on the basis of conventional wisdom about the way things work. In a dynamic, evolving economy, long-standing perceptions may become increasingly inconsistent with current reality, particularly when the system has been exposed to dramatic changes such as structural adjustment, market liberalization, and the advent of new technology. In such a setting, entrenched perceptions about the way farmers, traders and consumers actually behave may lead to unintended and even counterproductive government policy. This paper aims to demonstrate how monitoring the rural economy through timely, periodic and reasonably representative household surveys can inform debate on existing and emerging policy issues.

Agricultural policy in Kenya revolves around the widely accepted goals of income growth, commercialization, food security and equity considerations. But progress toward these goals cannot be measured, and expenditures in their pursuit be prioritized or justified, in the absence of data on how the agricultural economy really works. While agricultural data is collected by various organizations in Kenya, it is frequently reported in ways that cannot usefully shed light on major policy issues or inform key policy debates. The weak state of agricultural sector data makes planning on the basis of available data extremely hazardous. This leaves analysts and policy makers with little apart from intuition, conventional wisdom and political expediency as guides to policy making.

Tegemeo is contributing to improved policy making through availing policy relevant data to sectoral policy makers. This paper presents baseline data (1996/1997 season) on a set of indicators of the state of agriculture and rural welfare that are useful for monitoring policy objectives mentioned earlier – income growth, commercialization, food security and equity. The paper also provides information on rural conditions and perceptions that are not commonly reported by other statistical organizations in Kenya. The report is organized into sections as follows:

## **Section 2. Sample Design and Selection**

## **Section 3. Sources and Levels of Rural Household Income**

## **Section 4. Agricultural Production and Input Use**

## **Section 5. Household Food Consumption Patterns**

## **Section 6. Household Crop Purchase and Sale Behavior**

## **Section 7. Household Perceptions of Changes in the Performance of the Grain Marketing System**

## **Section 8. Equity**

## **Section 9. Conclusions**

The paper has several conclusions and recommendations:

- Much of the 'conventional wisdom' on which policy is based is not supported by evidence, and often is incorrect. An example of incorrect conventional wisdom is that most farmers in Kenya prefer high maize prices and derive an important part of their income from selling maize. While this view does fit a certain, relatively small strata

of farmers in selected areas of Kenya, most farm households in Kenya stated a preference for low maize prices as they are net buyers of this commodity.

- The large proportion of farming households, even in what are always thought of as maize surplus zones, that buy maize may warrant further consideration of the costs and benefits of policies designed to raise local maize prices, such as the current maize import tariff and producer support price schemes.
- Dealing with the agricultural sector as if it were a homogeneous monolith may give misleading impressions and can have impacts that go contrary to overall sectoral policy objectives. Agricultural policy making in a resource-constrained environment may be more effective if based on an understanding of the limits in achieving certain outcomes for all farmers in all regions and for all crops. Important regional differences suggest that tailoring policies with their regionally desegregated impacts in mind can lead to improved outcomes.
- Poor food deficit households have characteristics distinct from cash crop and wealthier households that suggest that if the alleviation of poverty is an important goal of agricultural policy, more attention needs to be focused on such households.

## **2. SAMPLE DESIGN AND SELECTION**

The sample was based on proportional sampling based on population. Census data was used to find the populations of all non-urban divisions in the country. The populations in all these divisions were assigned to one or more agro-ecological zones (AEZ) based on secondary data<sup>1</sup> and in-house experience. This process resulted in dividing Kenya's rural population into its make up by AEZ. Within each AEZ, two or three divisions were chosen on the basis of their importance (population) within their AEZ. Diversity in cropping patterns was allowed to influence the selection of divisions where it was not clear which divisions to choose.

These divisions fell within 24 districts. The divisions were regrouped into the 9 agro-regional zones – a hybrid of broad agro-ecological zones, administrative and political boundaries – presented in Table 1.

A team of researchers visited the selected divisions in order to select locations, sub-locations and villages in which the survey was to be conducted. This was normally done through a blind equal chance ballot where a local official, usually the District Officer or District Agricultural Extension Officer helped choose the location, the Chief helped choose the sub-locations and Assistant chiefs chose the villages. The process of choosing households was a little more tedious but followed a similar pattern. Where a list of all the households was available (e.g. in famine relief areas) this list was used. Where other lists were available, e.g. coffee societies, those were used (but ultimately discarded due to bias – not all households grow coffee, and co-operative members tended to be older members of the community).

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<sup>1</sup> This exercise depended heavily on the 1990 Census, District Development Plans and The Farm Management Handbook. CBS was not willing to share its sample frame.

Most commonly the team would collect together a group of community members and list all households in the village. Extra care was taken that e.g. households of unmarried mothers and widows were included.. The resulting list was divided by the number of households required. This gave us a step between households in the list. Balloting was used to determine at what position in the list the selection would begin, then e.g., every 5<sup>th</sup> house would be chosen for interview. Appointments were made immediately but followed up through some local link person two weeks in advance of the visit.

## **2.1. Implementing the Survey**

The actual administration of a survey of 1,540 households proved to be a major organizational and logistical operation. The questionnaire was administered by a team of 25 enumerators organized in 4 teams each led by a supervisor. The enumerators were hired from the recently graduated 1991 class in Agricultural Economics and Agri-Business Management of Egerton University. The supervisors were Tegemeo research assistants. All undertook a period of training that involved understanding the questionnaire in English, Kiswahili and, where possible, the local language in the areas they would be operating in. The enumerators were grouped to reflect the different languages spoken in different regions of the country. Once the instrument was understood by all in the same way, and each question could be asked to elicit the required response from the respondents, the team went out on a series of pre-tests where all involved had several chances to try out the questionnaire on farmers. The iterative process of pre-test and office based trouble shooting was important to minimizing enumerator based errors in data collection, through misunderstanding the question, asking it in the wrong way, or being misunderstood by the respondent. Each evening the teams and their supervisor would go over the filled questionnaires looking out for such problems.

The 4 teams of supervisor, 6 enumerators, driver and 4 wheel drive vehicle averaged about 13 interviews per day over a period of six weeks in April and May 1997. Each interview took anywhere from one and a quarter to two and a half hours. The combination of early starts, long travel distances, 20 page interviews, and checking over filled-out questionnaires in the evenings was quite demanding and needed a young and motivated team.

Data entry was done in SPSS and took 8 weeks. Data cleaning was a long and involving process that is still continuing. The data is organized in 11 files with a total of 1,200 variables, and over 1,500,000 entries.

**Table 1. The Sample**

<b>Zone</b>	<b>District</b>	<b>% of Population</b>	<b>Households sampled</b>	
<b>Northern Arid</b>		2.6		<b>40</b>
	Garissa		20	
	Turkana		20	
<b>Coastal Lowlands</b>		5.19		<b>80</b>
	Kilifi		54	
	Kwale		26	
<b>Eastern Lowlands</b>		10.78		<b>166</b>
	Taita Taveta		11	
	Kitui		21	
	Machakos		22	
	Makueni		77	
	Mwingi		35	
<b>Western Lowlands</b>		12.21		<b>188</b>
	Kisumu		111	
	Siaya		77	
<b>Western Transitional</b>				<b>172</b>
	Bungoma(Kanduyi)		50	
	Kakamega (Kabras,Mumias)		122	
<b>HP Maize Zone</b>		26.69		<b>411</b>
	Bungoma (Kimilili,Tongaren)		39	
	Kakamega (Lugari)		28	
	Bomet		43	
	Nakuru		114	
	Narok		25	
	Trans-Nzoia		61	
	Uasin-Gishu		101	
<b>Western Highlands</b>		10.13		<b>156</b>
	Vihiga		64	
	Kisii		92	
<b>Central Highlands</b>		17.4		<b>268</b>
	Muranga		74	
	Nyeri		107	
	Meru		87	
<b>Marginal Rain Shadow</b>		3.83		<b>59</b>
	Laikipia		59	
<b>Total</b>				<b>1540</b>

## **2.2. The Survey Instrument**

The questionnaire was composed of 20 A4 pages covering a wide range of topics. The final document had the following components:

- Enterprise table for the long rain crops of 1996/1997 and 1995/1996. Enterprise, acreage, production, sales and price, fertiliser, seed and land preparation types and quantities.
- Enterprise table for short rain crops of 1996/1997 and 1995/1996.
- Livestock output and revenue (products and animals) for calendar year 1995 and 1996
- Questions on changes in cropping patterns over time.
- Land tenure and the functioning of land markets.
- Participation in grain markets.
- Maize Sales: the seasonal pattern of sales, who sold to, where and why, transport mode and cost.
- Cereal Purchases: the seasonal pattern, quantities, units and who bought from.
- Staple Consumption: types, weekly/monthly quantities, percent own production.
- Demography: Name, sex, age, education, employment, informal activities, and total monthly income.
- Labour use in main maize crop: number of people, number of days, hired or family, male, female or children, hours per day for each activity in maize production.
- Off-farm income earning activities.
- Access to, and use of credit, fertiliser and hybrid maize seed.
- Access to Infrastructure: distances to fertiliser seller, veterinary and extension services, telephone, roads piped water etc.
- Household Agricultural Assets: Type, quantity, and value.
- Informal Income Earning activity: Individuals involved, types of activities, monthly sales, profit.

The following sections present basic descriptive findings of the survey with commentary on implications for policy in Kenya.

## **3. SOURCES AND LEVELS OF RURAL HOUSEHOLD INCOME**

Household incomes vary greatly in Kenya, across regions and in its composition between crop, livestock, and non-farm sources (Table 2). Total household income averaged Ksh 115,577 during the 1996/1997 year (roughly US\$2,100). This is relatively high by African standards. In neighboring Ethiopia in 1996, mean rural household income averaged about \$400.

There is significant regional variations in household incomes. Household income ranged from a high of Ksh 197,685 in the High-Potential Maize Zone (Trans Nzoia, Uasin Gishu, Nakuru, Bomet, and parts of Bungoma and Kakamega districts) to a low of Ksh 60,728 in the Western Lowlands (Siaya and Kisumu). In general, household income varied roughly

according to agro-ecological potential but there were notable exceptions. Coastal Lowlands (Kilifi and Kwale), for example, had an average household income of Ksh 169,043, due to the importance of non-farm income in these areas. Western Highlands (Kisii and Vihiga), while highly fertile areas, are characterized by relatively small farm sizes which constrain household income from agriculture. Households in these districts also recorded the smallest non-farm incomes in the sample. The findings indicate that household incomes and vulnerability to food insecurity are not necessarily correlated with agro-ecological potential. Households in some areas have developed a wide portfolio of income-earning activities which offer some income stability in the face of potential crop failure.

**Table 2. Composition of Rural Household Income, 1996/1997**

Region	Total household income (Ksh/hh)	---- Agricultural income (Ksh/hh) --		
		Crops	Livestock	Non-farm income
High Potential Maize zone	197,685	91,953 (47)*	55,524 (28)*	50,208 (25)*
Central Highlands	169,166	66,312 (39)	40,506 (24)	62,348 (37)
Coastal Lowlands	157,278	15,134 (10)	13,047 (8)	129,097 (82)
Eastern Lowlands	110,432	23,997 (22)	21,300 (19)	65,135 (59)
Marginal Rain Shadow	94,622	25,855 (27)	31,045 (33)	37,722 (40)
Western Transitional	89,953	36,980 (41)	19,882 (22)	33,091 (37)
Western Highlands	60,850	19,181 (32)	17,627 (29)	24,042 (39)
Western Lowlands	60,728	18,551 (31)	9,973 (16)	32,204 (53)
Average	134,893	52,126 (39)	32,926 (24)	49,841 (37)

\* Numbers in parentheses denotes % share of total household income.

Source: Egerton University/KARI/MSU Rural Household Survey, 1996/97 season.

Over the entire sample, crop income accounted for 39% of total household income, while livestock accounted for 24% and non-farm activities the remaining 37%. However, non-farm activities formed the largest source of income in Eastern Lowlands, Coastal Lowlands, Western Lowlands, Western Highlands, and Marginal Rain Shadow, and was roughly equal in importance to crop income in Central Highlands. Only in the High-Potential Maize Zone and Western Transitional (parts of Bungoma and Kakamega districts) was crop production the dominant source of household income.

The highest values of crop production per acre are, as expected, in the Central Highlands. The crop production activities in the HP Maize Zone are worth only marginally less. The value of crop production in all other zones is at least Ksh 10,000 per acre lower. The value of crop production in the poorest performing zones are only 1/3 those in the best performing zones. If Kenya is to make significant inroads into raising agricultural incomes, the special problems of those poorly performing zones needs to receive attention.

Kenya's richest farmers are the primarily maize and dairy producers of the Rift Valley whose incomes traditionally were boosted by protective policy against imports (e.g. tariffs) and by parastatal marketing monopolies such as the NCPB and KCC. Liberalisation has done no harm to their top ranking in farm and total income. If a similar survey had been undertaken earlier, it would have been possible to examine the impact of market liberalisation for the traditional products of the central highlands on their relative ranking in agricultural income.

Livestock income, while never the dominant source of income in any of the zones, nevertheless made an important contribution to household income, typically between 15-30%. These results highlight the necessity of viewing non-farm and livestock activities as an integral part of rural welfare. The results also underscore the potential ineffectiveness of attempting to stabilize household incomes in any broad based manner through crop price supports on particular commodities.

The sale of livestock products reflects the intensity of the livestock production enterprise. Households in all zones sell between Ksh 10,000 – 55,000 worth of animal products (primarily milk) per year. Only in the Central Highlands do sales of livestock products approach 75% of the value of livestock assets (Figure 1). For much of the rest of the country livestock is a low input-low output activity that is more of a traditional store of value and a source of psychic income than a serious commercial enterprise. Intensification of the livestock activities of Kenyan households could significantly contribute to agricultural income. But increasing offtake will require relatively large public and private investments in pasture management and disease control and improvement of the genetic potential of animals that resource constraints may frustrate. Livestock assets dominate total non-land, non residential building assets across all zones except the Maize Zone where movable assets such as vehicles, tractors, land preparation and transport equipment are significant as are such immovable assets as storage structures and water tanks. Assets are particularly low in the coastal and three western zones. In these zones total assets are less than Ksh 40,000 per household.

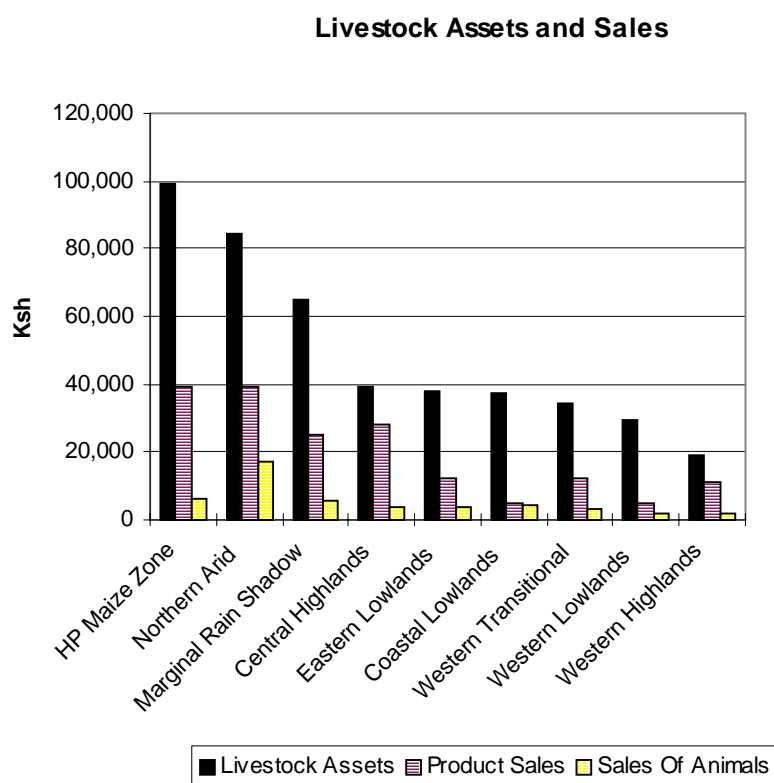
### **3.1. Non-Farm Income Sources**

Table 3 shows the proportion of households in each region engaging in various types of non-farm activities. Table 4 presents average incomes for households engaging in various non-farm activities. Formal wage employment was, on average, the most important non-farm activity both in terms of the percentage of households involved and the amount of money earned. Formal wage employment was particularly high in areas such as Machakos, Makueni, and Mwingi. Farm labor engaged a significant proportion of households only in a few areas such as Bomet and Vihiga, and even then the magnitude of income from farm labor was generally small compared with other non-farm activities. Grain trading is an important source of household income in grain-deficit areas such as Machakos, Kisumu, and Siaya; many households from these areas are involved in procuring grain from other areas and selling within their home areas. Other forms of commerce are important in Machakos, Narok, and the Coast. While the types of non-farm activities were relatively few in some areas (e.g., Taita Taveta, Bomet and Nakuru), there was considerable diversity in non-farm activities in other areas such as Kilifi, Kwale, Kitui, Machakos, Bungoma and Kakamega. The basic picture is that household incomes are remarkably diverse, even in areas of high agro-ecological



potential. For example, despite major concerns over maize price stability to protect farmer interests, in only two districts did maize production account for more than 30% of total income, and was considerably less in most districts, averaging about 12% over the entire sample.

**Figure 1. Livestock Assets and Sales**



**Table 3. Percentage of Households With Off-Farm Activities**

District	No-off farm activity	Labor			Self-Employment							
		Formal wage labor	Farm labor	Non-farm labor	Grain trader	Cash crop trader	Non-ag. commerce	Manu- facture	Service	Special skills	Fish related	Others
Kilifi	2	67	0	24	0	6	28	9	19	9	6	0
Kwale	0	42	4	8	0	0	27	4	8	15	46	12
Taita Taveta	36	45	0	18	0	9	0	0	9	0	0	0
Kitui	5	48	19	19	5	0	10	10	5	38	0	0
Machakos	14	64	5	5	18	0	23	14	5	18	0	9
Makueni	13	62	6	9	8	5	16	3	6	6	0	3
Meru	26	53	8	3	6	5	10	0	9	1	0	0
Mwingi	6	80	11	3	3	0	6	9	0	29	0	0
Kisii	50	25	9	3	4	2	9	1	5	3	1	1
Kisumu	27	24	14	9	20	5	19	5	3	7	4	4
Siaya	30	26	12	1	19	1	12	6	0	4	9	1
Bungoma	28	27	6	4	10	2	11	6	11	7	2	2
Kakamega	37	20	13	7	11	2	15	3	8	7	2	2
Vihiga	39	28	23	5	3	5	13	2	2	3	0	0
Muranga	31	46	16	9	0	0	7	1	8	3	0	0
Nyeri	34	35	13	15	1	0	13	3	8	2	0	2
Bomet	49	26	19	9	0	0	9	2	0	0	0	0
Nakuru	44	37	8	6	3	4	4	1	4	3	0	3
Narok	32	20	0	0	20	4	20	0	16	0	0	20
Trans Nzoia	10	38	16	13	5	3	7	3	15	10	2	3
Uasin Gishu	36	37	10	0	5	3	9	2	6	2	0	3
Laikipia	24	36	12	10	0	3	10	2	8	7	0	2
Total	30	36	11	7	7	3	12	3	7	6	2	2

Notes: "Special skills" includes village elders, traditional doctors, and others.

**Table 4. Mean Off-Farm Income by Activity and District in Ksh**

District	No-off farm	Labor			Self-Employment							
		Formal wage labor	Farm labor	Nonfarm casual labor	Grain trader	Cash crop trader	Com-merce	Manu-facture	Service	Special skills	Fish related	Others
Kilifi	0	95656	0	57147	0	26528	34.643	23.216	43.134	14.718	10.45	0
Kwale	0	68836	11011	32127	0	0	82.193	54.837	58.495	52.979	171.007	295.425
Taita Taveta	0	105600	0	18457	0	439	0	0	68.848	0	0	0
Garrisa	0	53400	0	0	0	20.643	9.899	0	28.989	0	0	15.947
Kitui	0	52200	5134	2163	3272	0	10.206	45.996	1.035	17.02	0	0
Machakos	0	83066	14880	10618	46175	0	23.369	24.788	1.077	24.127	0	22.326
Makueni	0	85678	9595	7488	20306	16.962	23.662	3.637	37.582	46.657	0	194.159
Meru	0	116296	8795	7548	23236	12.254	112.912	0	60.915	39.895	0	0
Mwingi	0	64123	8234	8931	3853	0	27.385	30.757	0	3.184	0	0
Kisii	0	50194	6994	3222	164034	5.512	39.494	4.365	23.755	37.362	4.695	3.548
Kisumu	0	68689	5875	12300	43852	6.655	16.778	6.32	19.757	20.244	11.196	35.949
Siaya	0	59732	5366	4406	29637	4.48	22.769	13.58	0	24.169	5.956	16.545
Bungoma	0	63658	13104	10261	37570	12.605	20.839	23.211	11.179	6.573	18.377	33.011
Kakamega	0	67064	36624	17808	15833	89.012	36.378	24.774	46.677	39.209	29.732	26.406
Vihiga	0	52400	4733	12603	17730	2.654	9.524	5.081	19.723	40.622	0	0
Muranga	0	76408	8019	7577	0	0	41.486	12.086	62.653	22.317	0	0
Nyeri	0	78246	11545	10837	37462	0	65.108	28.761	136.632	23.897	0	41.463
Bomet	0	80945	6025	5920	0	0	16.692	16.507	0	0	0	0
Nakuru	0	112080	8053	22129	92645	5.699	12.422	0	72.368	82.95	0	74.421
Narok	0	97680	0	0	117497	2.372	52.579	0	86.836	0	0	318.429
Trans Nzoia	0	58826	11499	6432	34740	2.231	7.521	9.848	58.388	34.026	8.216	96.98
Uasin Gishu	0	52104	49423	0	45629	5.147	54.102	55.872	158.928	15.958	0	260.54
Laikipia	0	78800	22072	9172	0	9.531	6.845	41.911	31.577	18.012	0	4.386
Turkana	0	53100	0	2342	0	0	18.083	0	8.529	0	0	0
Total	0	77683	14401	16294	42459	15.382	36.096	21.54	57.142	26.642	69.963	129.218

Notes: Figures are mean income for those households that engaged in activity i in district j.

The data indicates certain interesting patterns relating to how households cope with their relative lack of income from agricultural sources. The coastal lowlands in particular shows very high participation in off-farm activities (fishing and preparing food for factory workers in two of the main sites). Average monthly income from this source for the 84% of households involved is an impressive Ksh 9,132 or Ksh 82,000 per annum. High participation in off-farm activities among coastal households is also reflected in a relatively high 59% (2nd only to Eastern) of households involved in salaried employment with the average salary income second only to the Central Highlands. The coastal lowlands also reflect the second highest proportion of cases (56%) receiving remittances from family members not in residence at the farm for most of the year.

The Eastern Lowlands also show relatively high participation in off-farm salaried employment and receipt of remittances. Both these low agricultural income zones display links to off-farm income earning activities, either within the area, or through family members who spend much of their time away from home but do send home over Ksh 2,000 per month. Western Lowlands reflect relatively high participation in off-own farm income earning activities and remittances, but those remittances average less than Ksh 1,000 per month. The poverty problems of the Western Lowlands are exacerbated by the low participation in salaried employment that is only higher than in the relatively agriculturally well endowed Central Highland and Western Transitional zones.

This regional breakdown should not mask the overall, and important finding that that 50% of Kenyan farming households are involved in off-farm income earning activities, 36% of households have at least one salaried member living on the farm, and 33% of them receive remittances. Any efforts made to improve the general economy will benefit agricultural households as most are dependent on non-agriculture for a significant portion of their income.

## **4. AGRICULTURAL PRODUCTION AND INPUT USE PATTERNS**

### **4.1. Farm Size and Land Tenure**

There is great diversity in average household landholding size across regions. Average landholdings range from a low of 2.16 acres per household in the Western Highlands (Vihiga and Kisii districts) to a high of 8.5 acres in the High Potential Maize Zone (Table 5). Average farm size among the entire sample was 5.19 acres. However, actual land use was slightly higher than this at 5.32 acres due to land rental. Overall, 73% of the land used was for crop cultivation, 23% was pasture and fallow, while the remaining 3% was woodlot. As would be expected, the proportion of land devoted to crops was highest where farm sizes were the smallest, as in Western Highlands. Only about 15% of land was held in fallow in these areas. The proportion of land under fallow was as high as 47% in the Marginal Rain Shadow area (Laikipia) and 32% in the High-Potential Maize Zone (perhaps reflecting the importance of pasture land in the presence of dairy price supports). However, there was considerable diversity even within these zones.

Based on analysis in progress, preliminary results are emerging that farm size is an important determinant of commercialization and diversification into higher valued crops. A significant

proportion of households with relatively small farms in fertile areas display high levels of crop commercialization (defined as the percentage of total crop production that is marketed) featuring high-valued crops such as horticulture, tea, and coffee. The shift into higher-valued cash crops while perhaps successful in raising farm productivity (the value of output produced on scarce land), also makes households more dependent on the market to acquire their residual food needs. As will be shown later, a large proportion of rural households across all regions are net buyers of maize (i.e., they buy more than they sell), with important implications for maize pricing and trade policy.

Land tenure arrangements generally fall into three categories: (1) ownership with title deed; (2) perception of ownership but with no title deed; and (3) ownership of the land by parents or relatives with implicit rights of inheritancy passed on to the current users. Over 50% of the households surveyed in Western Lowlands (Siaya and Kisumu), Central Highlands (Nyeri, Muranga, and Meru), and Marginal Rain Shadow (Laikipia) had land title deeds. Ownership of title deeds declined to 11% along the coast and was only 20% in the Eastern Lowlands (Mwingi, Kitui, Machakos, and Makueni). The effect of land tenure structure on farm investment and productivity has been the subject of numerous studies with conflicting findings.

## **4.2. Cropping Patterns**

Table 6 presents information on how cultivated area is allocated to different crops, by region. The diversity of cropping patterns across Kenya is particularly striking. As expected, the crop that accounts for the single largest contribution to cropped area is maize. For all regions sampled, about 7.7% of cropped area was monocropped with hybrid maize, 1% of cropped area was monocropped with traditional maize varieties, and 17% of the cropped area was devoted to maize intercrops (mainly with beans). Thus, plots accounting for about 25% of total area had maize planted on them, and this proportion did not vary greatly across regions. The regions having the highest proportion of cropped area devoted to maize were the High-Potential Maize Zone (Nakuru, Trans Nzoia, Uashin Gishu, Bomet, and Narok), Western Highlands (Vihiga and Kisii), and along the coast. Regions having the smallest proportion of cropped area devoted to maize were Western Transitional (the lower-potential parts of Bungoma and Kakamega), Western Lowlands (Kisumu and Siaya) and Central Highlands (Muranga, Nyeri, and Meru).

**Table 5. Landholding and Land Tenure Characteristics of Rural Households, 1996/1997**

Region	Mean acres owned	Mean acres used	----- % of area used under -----			LAND TENURE ARRANGEMENT -----.% of households with -----				
			Crops / fodder	Pasture / fallow	Woodlot	Own title deed	Own but no title deed	Owned by parents / relatives but we use it	Use rights, community ownership	Other
Coastal Lowlands	4.438	3.903	79.58	19.23	1.17	11.4	64.6	19	1.3	3.8
Eastern Lowlands	6.041	5.063	71.54	23.79	4.52	20	72.7	6.7		0.6
Western Lowlands	3.742	3.593	74.06	22.78	2.29	50.8	35.1	13		1
Western Transitional	5.445	6.362	72.77	25.77	1.45	47.4	29.8	22.8		
High Potential Maize zone	8.508	9.114	64.53	31.55	3.76	47.1	39.6	10.2	0.3	2.9
Western Highlands	2.126	2.297	81.28	13.79	4.42	40.9	41.6	16.2		1.2
Central Highlands	2.971	2.888	80.42	15.95	3.53	60.7	27	10.9		1.5
Marginal Rain Shadow	5.355	5.959	51.25	47.74	1.01	61	11.9	22		5.1
<b>Average</b>	5.188	5.317	73.15	23.34	3.15	44.3	39.4	13.1	1.4	1.8

Source: Egerton University/KARI/MSU Rural Household Survey, 1996/1997 season.

**Table 6. Share of Total Cropped Area Devoted to Different Crops**

	Coastal Low-lands	Eastern Lowlands	Western Lowlands	Western Transitional	High Potential Maize Zone	Western Highlands	Central Highlands	Marginal Rain Shadow	TOTAL
	----- % of cropped area -----								
hybrid maize	15.9	3.46	2.68	2.92	12.74	4.49	4.97	3.86	7.69
traditional maize	6.9	7.31	6.64	1.32	.05	3.43	.05		0.99
maize/bean intercrop	15.5	16.95	14.23	16.79	18.33	25.26	13.55	11	17.02
bean/cowpea	6.9	16.07	3.93	5.21	10.21	.54	5.19	2.30	5.53
millet/sorghum	1.9	8.35	16.57	9.18	8.18	8.64	0.23	6.29	7.89
rice	19.6	.	3.63	.	.	.	.	.	0.47
wheat	.	.	.	.	15.55	.52	0.01	7.36	7.27
root crops	18.1	11.36	33.48	28.85	4.13	6.93	9.83	.82	11.61
banana	1.4	4.85	2.08	12.56	3.02	10.79	8.16	1.18	7.44
irish potato	1.9	4.64	.38	.63	7.28	.	16.88	22.2	6.22
coffee	.	4.14	1.75	.37	.78	10.61	9.30	.	4.56
tea	.	.	.	.	1.46	7.00	6.81	.	3.31
cotton	.	.	1.59	.	.	.	.	.	0.17
sugar cane	.	1.66	7.96	10.00	.33	.35	.86	.	2.95
horticulture	10.7	19.79	5.06	12.00	15.42	19.52	23.43	44.5	15.26
Other	1.2.	1.4	.	0.2	2.5	1.9	0.7	0.47	1.63
<b>TOTAL</b>	100	100	100	100	100	100	100	100	100

“Other” includes: pyrethrum, cashew nuts, tobacco, and fodder crops.

Source: Egerton University/KARI/MSU Rural Household Survey, 1996/1997 season.

Horticultural crops now account for the second largest share of crop land within the sites sampled. Horticulture accounts for 16% of cropped area over the entire sample, but this ranged from 5% in the Western Lowlands to over 40% in Laikipia.

Root crops such as cassava and arrowroot took up the third largest share of crop land across the sites sampled. Root crops were most important in the lowland areas, accounting for about

1/3 of cropped area in the Western Lowlands. Irish potatoes accounted for over 15% of area cropped in the Central Highlands and Marginal Rain Shadow zones.

An important observation from Table 6 is that the Highland areas generally have a larger share of total cropped area devoted to higher-valued crops such as coffee, tea, and horticulture, while most of the cropped area in the lowlands, particularly the Kisumu and Siaya areas, are dominated by relatively low-valued root and grain crops.

Tables 7 and 8 present households' responses on how they have changed their agricultural activities over time. Consistent with national level figures reported by Ministry of Agriculture which show a decline in grain production since the mid-1980s, surveyed households in most areas reported that their involvement in cereal production has decreased over time. The largest shift out of cereal production has been along the coast, in the Marginal Rain Shadow Zone, Western Lowlands, and Eastern Lowlands. Formerly, with controls on inter-district movement of maize, there may have been heightened incentives to achieve cereal self-sufficiency, which may have encouraged cereal production in these grain-deficit areas. But since these agro-ecological areas are generally not well suited to maize production, the decline in cereal production after cereal market liberalization may reflect a shift in cropping patterns more in line with comparative advantage, and a shift to higher valued crops. This is consistent with aggregate production figures showing that growth rates for crops such as horticulture are the highest in Kenya, while growth in cereal crop production has been generally stagnant. The only area where the majority of households stated that they have increased their involvement in cereal production since market liberalization was the High-Potential Maize Zone.

The findings in Table 8 show that over the past five years there has been a further shift into dairy production in areas such as Eastern Lowlands, Central Highlands, and the Marginal Rain Shadow. Involvement in dairy activities have remained stagnant or declined in the Western parts of the country.



**Table 7. Household Involvement in Cereal Production Compared to 5 Years Ago**

	More now	More 5 years ago	About the same	Not sure
	----- % of households -----			
Coastal Lowlands	23.1%	67.9%	9.0%	--
Eastern Lowlands	35.5%	60.8%	3.6%	--
Western Lowlands	19.3%	63.1%	16.0%	1.6%
Western Transitional	14.0%	55.8%	30.2%	--
High Potential Maize Zone	47.8%	29.0%	22.7%	0.4%
Western Highlands	24.4%	56.4%	17.9%	1.3%
Central Highlands	34.8%	48.3%	16.9%	--
Marginal Rain Shadow	11.9%	79.7%	6.8%	1.7%
<b>AVERAGE</b>	31.5%	50.2%	17.7%	0.6%

Source: Egerton University/KARI/MSU Rural Household Survey, 1996/1997 season.

**Table 8. Household Involvement in Dairy Production Compared to 5 Years Ago**

	More now	More 5 years ago	About the same	Not sure
	----- % of households -----			
Coastal Lowlands	5.2%	15.6%	79.2%	--
Eastern Lowlands	47.6%	30.5%	22.0%	--
Western Lowlands	15.5%	57.5%	23.8%	3.3%
Western Transitional	20.7%	66.2%	13.1%	--
High Potential Maize Zone	32.5%	50.9%	16.4%	0.3%
Western Highlands	30.8%	39.1%	28.8%	1.3%
Central Highlands	53.4%	30.6%	16.0%	--
Marginal Rain Shadow	40.7%	23.7%	33.9%	1.7%
<b>AVERAGE</b>	33.1%	43.2%	23.0%	0.7%

Source: Egerton University/KARI/MSU Rural Household Survey, 1996/1997 season.

### 4.3. Fertilizer Use

National-level fertilizer use statistics are unable to give an accurate picture of smallholder fertilizer use, since national level data seldom disaggregates commercial from smallholder conditions. In the regions covered by this survey, about 56% of the smallholder households used fertilizer on food crops (Table 9). Of the fertilizer users, roughly 45% applied less than 20 kgs per acre, while the other 55% applied an average of 52 kgs per acre. Once again, however, fertilizer use varied widely across regions. In the High-Potential Maize Zone, 89% of households applied fertilizer on food crops. Over 75% of farmers in the Central Highlands and Western Highlands applied fertilizer on food crops. But fertilizer use in the remaining areas dropped off considerably; even those using fertilizer generally applied less than 10 kgs per acre. Raising fertilizer use in these areas may be a key opportunity for food crop productivity growth and food security in Kenya.

**Table 9. Fertilizer Nutrient Use Per Acre on Food Crops by Agro-Regional Zone, 1996/1997**

Agro-Regional Zone	Fertilizer nutrient application per acre of food crops						Total <sup>a</sup>
	0 kgs	0 - 5 kgs	5-10 kgs	10-20 kgs	20-30 kgs	>30 kgs	
	----- % of households applying fertilizer -----						
Coastal Lowlands	96	2	0	1	0	0	100
Eastern Lowlands	71	22	2	5	0	0	100
Western Lowlands	96	2	0	2	1	0	100
Marginal Rain Shadow	83	4	9	4	0	0	100
Western Transitional	46	4	4	12	12	23	100
Western Highlands	25	13	16	22	14	10	100
Central Highlands	23	9	9	21	17	22	100
High-Potential	11	1	2	14	21	51	100
<b>Total</b>	<b>44</b>	<b>7</b>	<b>5</b>	<b>12</b>	<b>12</b>	<b>20</b>	<b>100</b>

Source: KAMPAP Household Survey, 1996/97 season. <sup>a</sup> Row total may add up to more or less than 100 due to rounding.

Table 10 shows how fertilizer was allocated to different crops by region. Since fertilizer use was low or negligible in the lowland areas, we focus our discussion on the High-Potential Zone, Western Highlands, Central Highlands, and Marginal Rain Shadow. In two of these regions, maize and maize/bean intercrops received the single largest share of fertilizer (36% of total fertilizer applied in the High-Potential Maize Zone and 32% in the Western Highlands). In the Marginal Rain Shadow and Central Highland regions, horticultural crops received the single largest share of fertilizer applied to crops, at 65% and 21%, respectively. Other crops that received a relatively large share of the fertilizer used in these areas were tea (in the Western

and Central Highlands), coffee and bananas (in Western Highlands), potatoes (in Central Highlands), and wheat in the High-Potential zone.

#### **4.4. Use of Hybrid Maize Seed**

Given the significant contribution of hybrid maize seed to maize productivity in Kenya (see Karanja, Jayne, and Strasberg 1998), it may be useful to examine the extent to which farmers in various regions use hybrids and the scope for further productivity gains through strategies focused on non-adopters. Another concern that has been occasionally voiced is that some farmers use retained hybrid seed from the previous year for planting rather than purchase the seed each year.

Table 11 shows the percentage of farmers using alternative maize seed types. The findings indicate that purchased hybrids account for the lion's share of maize area – almost 75% across all districts surveyed. As might be expected, the greatest use of hybrids is in the zones of highest potential. Hybrid seed use tapers off to 30% or below in the lowland areas. Re-planting of retained hybrids does not appear to be a serious problem in any of the areas surveyed.

**Table 10. Percentage of Total Fertilizer Used on Different Crops**

	Coastal Lowlands	Eastern Lowlands	Western Lowlands	Western Transitional	High- Potential Maize Zone	Western Highlands	Central Highlands	Marginal Rain Shadow	KENYA
	----- % of crop area fertilized -----								
hybrid maize	.	3.59	.	1.90	14.96	4.13	3.43	11.98	8.18
traditional maize	.	1.97	1.41	3.56	.06	2.02	.13	.	.49
maize/bean	.	7.9	18.78	16.15	21.12	26.15	14.43	9.37	17.86
bean/cowpea	.	4.81	.22	3.93	7.15	.73	3.21	1.06	4.74
millet/sorghum	100.00	.90	10.70	9.9	10.01	5.24	.34	2.61	5.33
rice	.	.	16.57	.	.	.	.	.	.08
wheat	.	.	.	.	16.06	.34	.02	1.41	6.67
root crops	.	5.84	19.74	29.25	3.22	2.92	10.58	.	8.13
banana	.	3.82	2.98	11.89	2.9	12.11	5.31	.	5.08
irish potato	.	1.70	.	.58	4.92	.	19.09	8.67	10.02
coffee	.	6.66	.	.17	.70	14.42	6.04	.	3.91
tea	.	.	.	.	4.74	13.78	13.73	.	8.67
cotton	.	.	.	.	.	.	.	.	.
sugar cane	.	16.13	14.33	10.69	.24	0.25	1.52	.	1.86
horticulture	.	46.47	15.26	11.74	11.53	15.49	20.75	64.91	16.95
Other	.	0.22	.	0.24	2.38	2.42	1.44	.	1.77
<b>Total</b>	100	100	100	100	100	100	100	100	100

Note: "Other" category comprised of tobacco, pyrethrum, and fodder crops.

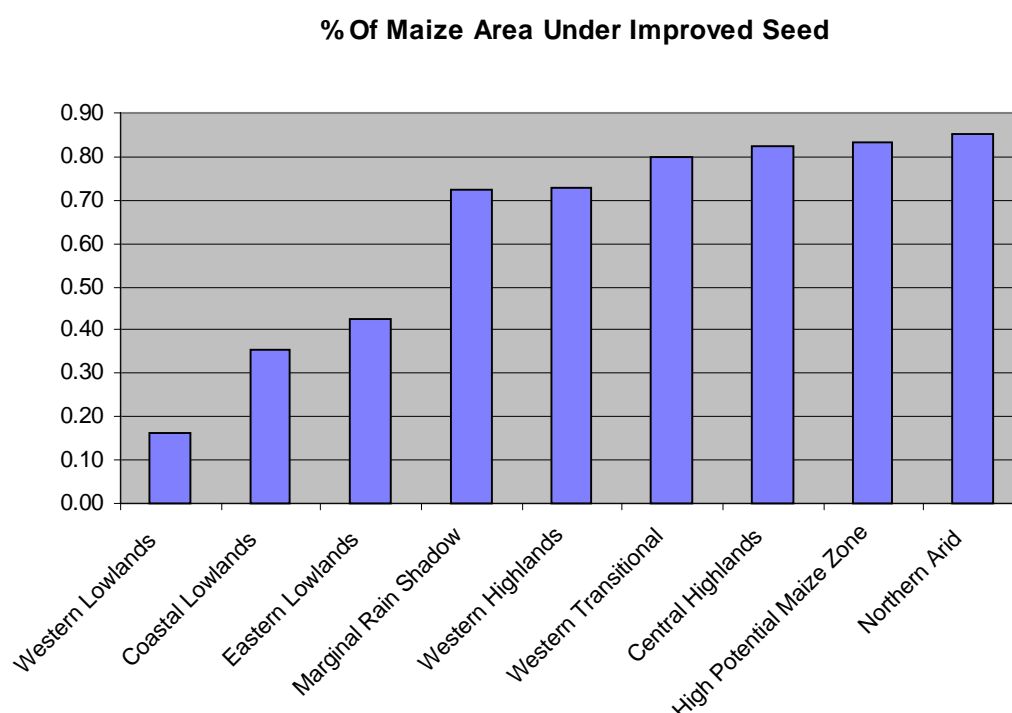
**Table 11. Percentage of Farmers Using Alternative Maize Seed Types**

	<b>Purchased Hybrid</b>	<b>Retained Hybrid</b>	<b>Open- pollinated variety</b>	<b>Local variety</b>
	----- % of area planted -----			
<b>Coastal Lowlands</b>	26.8%	3.7%	9.8%	59.8%
<b>Eastern Lowlands</b>	32.3%	.9%	19.0%	47.8%
<b>Western Lowlands</b>	17.8%	.6%		81.5%
<b>Western Transitional</b>	84.8%	.7%		14.5%
<b>High Potential Maize Zone</b>	92.9%	4.4%	.7%	1.9%
<b>Western Highlands</b>	73.8%	.4%		25.8%
<b>Central Highlands</b>	90.7%	2.2%	.7%	6.3%
<b>Marginal Rain Shadow</b>	91.2%		2.9%	5.9%
<b>AVERAGE</b>	74.9%	2.1%	3.1%	19.8%

Source: Tegemeo Institute/Egerton University/KARI/MSU Rural Household Survey, 1997.

Figure 2 shows the now-familiar pattern of the HPMaize zone and the Central Highlands doing well (along with the irrigated Northern Arid zone). Hybrid seed use is quite prevalent, at over 70% and 80 % across all zones outside of the Western, Coastal and Eastern lowlands. Of the sample used, 71% improved seed in 1996 and 30% of the sample are using more now than 5 years ago. Of those producing maize, 18% have never used improved hybrid or improved open pollinated seeds. The Western Lowlands are by far the worst performer where only 16% of maize area is produced from improved seed – certified open pollinated varieties or hybrids. This reflects the lack of seed varieties suitable for this region. Composite OPVs exist for both the coastal and eastern zones. However even in these zones, adoption is relatively low.

**Figure 2. Percent Of Maize Area Under Improved Seed**



Note: Northern Arid zone represents a non-random sample of riverine/irrigated producers.

#### **4.5. Use of Mechanized/Draft Power**

The percentage of households owning draft oxen and at least one plough varies widely across Kenya (Table 12). As might be imagined, there is a strong correlation between draft oxen and plough ownership, with highest levels in Western Transitional (lower elevation districts of Bungoma and Kakamega) and Eastern Lowlands (Machakos, Mwingi, Kitui, Makueni). But even in these areas, less than half of the households surveyed owned plough or draft oxen. In the High-Potential Zones and Central Highland areas, less than 20% of households owned either draft oxen or a plough.

##### *4.5.1. Agricultural Credit*

Despite the breakdown of the state credit system, about 40% of households surveyed across all zones received agricultural credit in 1996 (Table 12). Over 90% of the households who tried to get credit actually did receive it. This indicates that most farmers do not even bother to look for credit, but of those who do almost all receive it. This suggests some self selection in seeking credit where the majority of producers already have concluded that the effort would not be worthwhile or is not in their best interests.

The regions with the greatest proportion of households receiving credit were in Central Highlands, where coffee unions frequently provided in-kind input credit not only for use on

coffee but also for food crops. A large proportion of households along the Coast also received agricultural credit – 59%. By contrast, only 13% of households in Western Lowlands received credit, and only 25% of households received credit in the High-Potential Maize Zone (Table 12).

**Table 12. Percentage of Farmers Owning a Tractor- or Ox-plough, Draft Oxen, and Receiving Agricultural Credit, 1996/1997 Crop Season**

	Owens a plough	Own draft oxen (Mean # among hhs that do own)	Received agricultural credit
	----- % of households -----		
<b>Coastal Lowlands</b>	3.9	2.6 (7.00)	58.8
<b>Eastern Lowlands</b>	31.3	23.5 (2.49)	45.7
<b>Western Lowlands</b>	15.8	21.2 (3.03)	13.3
<b>Western Transitional</b>	42.9	41.1 (2.43)	39.5
<b>High Potential Maize Zone</b>	17.3	11.6 (3.02)	25.2
<b>Western Highlands</b>	5.2	3.9 (1.67)	47.1
<b>Central Highlands</b>	0.4	1.1 (1.67)	78.4
<b>Marginal Rain Shadow</b>	0	0	25.4
<b>AVERAGE</b>	15.5	13.6 (2.70)	41

Source: Tegemeo Institute/Egerton University/KARI/MSU Rural Household Survey, 1997.

Cooperatives and commercial banks were generally the leading sources of credit. Over half of those receiving credit (54% of recipients) got it from a co-operative society. Parastatals like the KTDA accounted for 14% of the total loans made to smallholders, while traders/shopkeepers/input distributors provided 12% and friends or relatives 11% of the loans made for agricultural purposes. The Agricultural Finance Corporation (AFC) gave loans to only 1% of households.

Over 85% of those loans were made to farmers in the Rift Valley, to farms averaging 19 acres (compared to 4.3 in the whole sample). Of the AFC loans, 13% were made to farmers in Central Highlands. Of all households using fertiliser, 46% financed the purchase with earnings from farming, 24% with off-farm income, and 16% through co-operatives.

## **5. HOUSEHOLD FOOD CONSUMPTION PATTERNS**

Table 13 presents information on the shares of calorie consumption accounted for by various foodstuffs. An important caveat of this section is that beans and other legumes were not included in the questionnaire (except in the form of githeri) and hence the calorie share information is computed without information on some forms of legume consumption. However, the table gives a clear indication of the relative importance of various commodities in each region, and how consumption patterns vary across regions. For example, the primary form in which maize is consumed varies greatly across regions. Consumption of purchased sifted maize meal is important in grain deficit areas along the Coast and in the Eastern Lowlands. In these areas, local supplies of maize grain may be in short supply during some times of the year, forcing some households to resort to buying relatively expensive sifted maize meal. By contrast, in the western parts of the country where local maize supplies are more plentiful, consumption of sifted maize meal is almost negligible. Here, the dominant form of maize consumption is posho meal, or maize grain milled for a fee at a local hammer mill. In the Central Highlands and Laikipia areas, posho meal accounts for about 70% of maize meal consumption. Githeri was also very important in several areas, notably Central Highlands, Eastern Lowlands, and Laikipia.

Secondary evidence indicates that the share of posho meal in rural consumption has risen since the cereal market reforms of the early 1990s. This is partially because the controls on maize grain during the control period exacerbated the depletion of grain supplies in grain-deficit rural areas once local production was exhausted. This made households in such areas dependent on purchased sifted meal. After the progressive removal of movement controls on private trade through the first half of the 1990s, inter-rural maize trade from surplus to deficit areas increased maize supplies in deficit rural areas, thereby providing households with a cheaper alternative to sifted meal. This issue is examined further in Section 7.



**Table 13. Shares of Various Foods in Total Staple Food Consumption, 1996/1997 Season**

	Northern Arid	Coastal Lowlands	Eastern Lowlands	Western Lowlands	Western Transitional	High Potential Maize Zone	Western Highlands	Central Highlands	Marginal Rain Shadow	KENYA
----- % of per capita calorie consumption from staples -----										
<b>posho meal</b>	59.21	38.18	23.40	46.49	55.35	63.37	55.29	21.92	39.91	44.79
<b>sifted maize meal</b>	6.62	30.52	12.81	1.06	.62	.45	.	8.18	12.02	9.03
<b>porridge</b>	1.55	1.76	4.86	6.61	4.91	3.72	5.10	1.44	.14	3.34
<b>githeri</b>	7.08	1.21	24.63	6.71	7.11	14.67	6.41	26.79	27.7	13.6
<b>wheat bread</b>	.10	3.84	.60	0.91	.17	.43	.32	.22	.73	.81
<b>wheat flour</b>	.88	4.96	2.62	1.08	0.19	3.67	0.62	4.03	5.30	2.59
<b>millet/sorghum</b>	12.76	.	.38	6.84	.29	1.06	2.79	1.07	.	3.60
<b>bananas</b>	1.22	1.50	12.60	1.51	7.78	3.38	22.87	14.30	.	8.14
<b>irish potato</b>	.77	.56	3.17	4.17	10.22	5.13	2.55	15.19	8.33	5.57
<b>muthokoi</b>	.	.35	8.05	.	.	.	.	.10	.	2.84
<b>rice</b>	8.06	10.42	2.75	5.53	.51	2.18	.81	5.78	5.77	4.65
<b>cassava</b>	1.76	6.67	3.71	19.08	12.78	1.84	3.22	.31	.	6.17
<b>yams/arrow roots</b>	.	.04	.41	.01	.07	.11	.02	.68	.11	.18

Source: Tegemeo Institute/Egerton University/KARI//MSU Rural Household Survey, 1997.

A few other noteworthy observations from Table 13.

- The contribution to total calorie intake from cooking bananas was about half as important as for maize (in all its forms) in the Western Highlands (Vihiga, Kisii, etc.), and about 1/4 as important as maize in the Central Highlands.
- Cassava's contribution to calorie intake in the Western Lowlands is about 1/3 that of maize in its various forms. Irish potatoes are also important in some areas, particularly the Central Highlands.
- Rice and wheat (bread plus flour) are relatively unimportant in the dietary patterns in all areas surveyed except along the Coast.

These results do show that maize continues to form the largest single contribution to calorie consumption among the crops on which data was collected. However, a well-designed rural food security strategy should pay explicit attention to crops such as cooking bananas, potatoes and casava due to their importance in consumption patterns in some areas.

## **6. HOUSEHOLD GRAIN PURCHASE AND SALE BEHAVIOR**

This section examines grain purchase and selling behavior of rural households. This information may be useful to determine who would benefit and who would suffer from price changes in various commodities.

Table 14 shows the percentage of rural households in each region that were net sellers of maize (i.e., sales of maize exceeded purchases), net buyers (purchases of maize exceeded sales) or neither buyer nor seller (did not participate in the market). The results indicate that, across all the zones sampled, about 61% of the households were net buyers of maize during the 1996/1997 year. Only 27.5% of farmers sold more maize than they purchased. This year was considered relatively normal in the western half of the country, but a severe drought year in many parts of eastern Kenya.

Table 15 shows the mean and median amounts of net sales per household (for both maize and sorghum) by region. Corroborating the picture in Table 14, the results show one major maize surplus area (High Potential Maize Zone), from which the bulk of marketed maize supplies come (from domestic production), and the rest of the country, which is maize-deficit. A similar picture emerges for sorghum.

**Table 14. Percentage of Rural Households That Were Net Sellers/Buyers of Maize, 1996/1997 Year**

	----- % of households -----		
	net maize buyer	net maize seller	neither buyer nor seller
<b>Northern Arid</b>	80.0%	7.5%	12.5%
<b>Coastal Lowlands</b>	88.8%	3.8%	7.5%
<b>Eastern Lowlands</b>	79.5%	19.9%	.6%
<b>Western Lowlands</b>	78.2%	8.0%	13.8%
<b>Western Transitional</b>	71.5%	18.0%	10.5%
<b>High Potential Maize Zone</b>	28.2%	58.4%	13.4%
<b>Western Highlands</b>	60.3%	21.2%	18.6%
<b>Central Highlands</b>	63.8%	23.9%	12.3%
<b>Marginal Rain Shadow</b>	96.6%	1.7%	1.7%
<b>KENYA</b>	61.2%	27.5%	11.3%

Source: Tegemeo Institute/Egerton University/KARI//MSU Rural Household Survey, 1997.

**Table 15. Net Household Sales (Sales Minus Purchases) of Maize and Sorghum, 1996/1997 Year**

		<b>Mean</b>	<b>Median</b>
<b>Northern Arid</b>	net sales for maize (kg/hh)	-258.35	-227.50
	net sales for sorghum (kg/hh)	30.38	.00
<b>Coastal Lowlands</b>	net sales for maize (kg/hh)	-580.97	-428.00
	net sales for sorghum (kg/hh)	-59.88	.00
<b>Eastern Lowlands</b>	net sales for maize (kg/hh)	-154.90	-180.00
	net sales for sorghum (kg/hh)	-2.10	.00
<b>Western Lowlands</b>	net sales for maize (kg/hh)	-307.30	-270.00
	net sales for sorghum (kg/hh)	-51.16	.00
<b>Western Transitional</b>	net sales for maize (kg/hh)	-319.56	-370.88
	net sales for sorghum (kg/hh)	.45	.00
<b>High Potential Maize Zone</b>	net sales for maize (kg/hh)	2229.31	355.50
	net sales for sorghum (kg/hh)	-2.65	.00
<b>Western Highlands</b>	net sales for maize (kg/hh)	-116.41	-135.00
	net sales for sorghum (kg/hh)	-13.99	.00
<b>Central Highlands</b>	net sales for maize (kg/hh)	-105.48	-90.00
	net sales for sorghum (kg/hh)	-12.87	.00
<b>Marginal Rain Shadow</b>	net sales for maize (kg/hh)	-692.24	-650.00
	net sales for sorghum (kg/hh)	-6.58	.00
<b>KENYA net sales for maize (kg/hh)</b>		411.50	-135.00
<b>KENYA net sales for sorghum (kg/hh)</b>		-13.36	.00

Source: Tegemeo Institute/Egerton University/KARI//MSU Rural Household Survey, 1997.

Tables 14 and 15 highlight the following points:

- The only region in the country in which over half of the surveyed households were net maize sellers was the High Potential Maize Zone (including Trans Nzoia, Uasin Gishu, Nakuru, Bomet, and Narok). In this zone, about 60% of the households were net sellers of maize. However, even in this zone, almost 30% of the households were net maize buyers.
- A majority of households were net buyers of maize in zones commonly perceived as grain surplus. For example, over 70% of households in the highlands areas of Vihiga and Kisii areas were net buyers of maize. About 60% of households were net buyers in Kakamega and Bungoma areas (Western Transitional).
- In most of these areas (with the exception of the High-Potential Maize Zones), the average net purchases by households ranged from one to four 90 kg bags. But this is only the mean level. In each area, the lowest 25% of the sample had net purchases of between 380 to 800 kgs per household.

A major implication for maize policy is whether most smallholder households are better off or worse off with policies designed to raise maize prices. The interests of commercial maize-surplus farmers have typically weighed prominently in the formation of cereals policy in Kenya, and has been reflected in various attempts over decades to support maize prices, with the assumption that this would contribute to rural income growth. In part, the longstanding perception of farmers as producing surplus maize has been propagated by the absence of reliable micro-level household-level data on maize marketing and purchase behavior. Whether this perception was always erroneous, or whether household food marketing patterns have changed over the past several decades due to declining farm size, population pressure, and soil degradation in some areas, the emerging picture from this survey is that a large proportion of rural farm households buy maize and are actually hurt by higher maize prices.<sup>2</sup> This picture, while needing verification through additional household surveys, is consistent with empirical evidence in other African countries (see, for example, Cousins, Weiner, and Amin 1992; Kirsten and von Bach 1992; Lele 1990; Odhiambo and Wilcock 1990; Weber et al. 1988). In Zimbabwe, normally a food exporter during the 1980s, the proportion of rural farm households that are net grain buyers is 70% or more in the drier areas where over 60% of the smallholder population lives. Of these households, about half purchase over 50% of their annual grain requirements (Jayne and Chisvo 1991). In Malawi, over 65% of the rural population were net buyers of maize in 1991, an unexceptional weather year (Kandoole and Msukwa 1992). These findings indicate that the effects of the reforms on food security will depend on the ability of the emerging private trade to reduce the costs of food to the grain-deficit and generally poorer regions.

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<sup>2</sup> Mellor and others had made this point decades ago in Asia, but the perception of rural food self-sufficiency in Africa has been modified more slowly, since lower population densities in most of Africa were often equated with land abundance and relatively egalitarian distribution of productive resources.

## **7. HOUSEHOLD PERCEPTIONS OF CHANGES IN THE PERFORMANCE OF THE GRAIN MARKETING SYSTEM**

This section examines the effects of grain marketing reform on household welfare, from the perceptions of rural households themselves. The information provides further understanding of households' responses to liberalization and also important implications for cereal pricing and trade policy.

### **7.1. Relationship Between Grain Prices and Households' Perceived Welfare**

To further corroborate the findings in the previous section showing that a sizable portion of households in Kenya's rural areas are net buyers of maize, we asked the following questions to households: "Would your household be better off with high maize prices or low maize prices?" and "Would your household be better off with higher maize prices than in 1996 or lower maize prices than in 1996?" The reason for asking the second question is to obtain responses with reference to a particular price level. In general, 1996 was a year of relatively low real maize prices, with levels ranging from 71-89% that of the average over the 1994-1998 period for selected markets: Eldoret, Kisii, Kitale, Kisumu, Nakuru, Nyeri, Meru, Mombasa, and Nairobi.

Results are shown in Table 16. Roughly two-thirds of the respondents stated that they are better off with low maize prices, even lower than those of 1996. The preference for lower maize prices was particularly evident in the low-potential areas such as Western Lowlands, and Coastal Lowlands, but also in relatively high-potential but grain-deficit areas such as Western Transitional and Marginal Rain Shadow. Only in the High-Potential Maize Zone did the majority of households state a preference for higher maize prices than in 1996. These household perceptions lend further support to the findings in the previous section showing that the majority of rural farm households in most areas are net buyers of maize.

### **7.2. Household Perceptions of the Performance of the Current Marketing System Compared to the Controlled Marketing System**

Considering the foregoing results indicating that many households in rural Kenya are net purchasers of maize, it would be valuable to know how households' themselves feel about the ease of purchasing maize under the current liberalized marketing system compared to the former control period. Respondents were asked the following question: "The government has liberalized (soko huru) the maize market since 1992. Compared with 5-10 years ago, is maize grain now (for the past 2 years) more readily available or more scarce in the local market?"

The first 3 columns of Table 17 show the results. Overall, almost 60% of the households surveyed felt that the availability of maize grain for purchase has improved since the controlled marketing period vs. 31% who felt it had deteriorated. Ten percent of the households perceived no change. The regions where the greatest proportion of households perceived an improvement in the availability of maize grain were in the Eastern Lowlands, Coastal Lowlands, Western Lowlands, and Western Highlands. As mentioned earlier, many of these

households now have the option of purchasing maize grain and milling it at local small-scale mills at considerably less cost than purchasing sifted maize meal. Moreover, as shown in Karanja, Jayne, and Strasberg (1998), inflation-adjusted maize prices in local markets have generally declined by 15-25% in the 1994-1998 period compared to prices in the 1980s. This also undoubtedly contributes to the perception of better conditions for net-grain buyers. Interestingly, the one region where a greater number of households said maize grain was in greater supply during the control period was in the Marginal Rain Shadow, which has suffered two consecutive droughts in recent years.

**Table 16. Relationship Between Grain Prices and Households' Perceived Welfare**

	Whether hh better/worse off with higher maize grain price		Whether hh better maize prices higher/lower 1996 price	
	----- % of households stating preference for -----			
	High maize prices	Low maize prices	High maize prices	Low maize prices
Northern Arid	22.2%	77.8%	18.5%	81.5%
Coastal Lowlands	8.8%	91.3%	6.3%	93.8%
Eastern Lowlands	21.7%	78.3%	23.5%	76.5%
Western Lowlands	7.4%	92.6%	6.4%	93.6%
Western Transitional	19.8%	80.2%	18.6%	81.4%
High Potential Maize Zone	68.1%	31.9%	68.9%	31.1%
Western Highlands	25.6%	74.4%	25.6%	74.4%
Central Highlands	31.7%	68.3%	31.0%	69.0%
Marginal Rain Shadow	3.4%	96.6%	1.7%	98.3%
KENYA	33.0%	67.0%	32.8%	67.2%

Source: Tegemeo Institute/Egerton University/KARI/MSU Rural Household Survey, 1997.

**Table 17. Household Perceptions of the Performance of the Current Marketing System Compared to the Controlled Marketing System, Kenya**

	Maize grain availability 1995-1997 ----- % of households responding -----			Convenience of selling grain 1995-1997 ----- % of households responding -----			Marketing system preference ----- % of households responding -----		
	Better now	Better during control period	No change	Better now	Better during control period	No change	Prefer current system	Prefer control system	No change
Coastal Lowlands	85	8	7	50	10	40	67	23	10
Western Lowlands	68	21	11	81	14	5	52	44	4
Eastern Lowlands	85	7	8	87	3	10	75	17	8
High-Potential maize zone	42	52	6	93	5	2	61	36	3
Western Highlands	69	21	10	84	11	5	53	44	3
Western Transitional	58	37	5	99	1	0	37	61	2
Marginal Rain Shadow	32	45	23	90	5	5	71	27	2
Central Highlands	56	28	16	82	8	10	76	16	8
National Average (weighted)	59	31	10	88	7	5	61	34	5

Source: Tegemeo Institute/Egerton University/KARI/MSU Rural Household Survey, 1997.



Households were also asked how conditions have changed over the past 5-10 years with regard to selling grain. In spite of the fact that grain wholesale prices have declined during the post-liberalization period, the overwhelming majority of households in all regions (88%) stated that it was more convenient to sell grain since liberalization (Table 17).

There are two reasons for this: First, most traders buying maize now pay cash immediately at the time of the transaction, in contrast to sales to NCPB, which often took months for reimbursement. Second, most farmers are now able to sell their grain at or very near the farm premises. Just under 70% of farmers selling maize sold to traders who collected the grain from the farm (Table 18). Farmers are not much involved in moving their maize from farm to market. Lorries to local markets account for 17% of sales transactions. Human portage is the most important transport mode after lorries, suggesting that most sales take place very near the farm.

**Table 18. Where And How Farmers Sell And Transport Maize**

	% of transactions
Bought at Home	69.6
Lorry	17.21
Human Portage	7.94
Tractor-trailer	1.24
Other	1.22
Animal drawn cart	1.19
Animal	0.82
Bicycle	0.37
Matatu	0.21
Pick-up	0.21

Source: Tegemeo Institute/Egerton University/KARI/MSU Rural Household Survey, 1997.

The final perception question asked of survey respondents was "On the whole, would you prefer to go back to the grain marketing situation as it was 5 years ago, or do you prefer the present grain marketing system?" Responses to this question are shown in the final 3 columns of Table 17. Overall, 61% of households stated a preference for the current system while 34% preferred the former system. As with the previous questions, the preference for the current liberalized system was strongest in the grain-deficit areas such as Central Highlands, Coastal Lowlands, Eastern Lowlands, and Marginal Rain Shadow. Only in the Western Transitional zone (Kanduyi division of Bungoma District and the Kabras and Mumias divisions of Kakamega District) did the majority of households prefer the farmers controlled marketing system.

### 7.3. Regional Distribution of Grain Sales and Purchases

Table 19 gives a number of insights into the operation of the national and regional maize markets in the post-liberalisation period. The first column of data shows that the rural sector in the aggregate sell 195%, almost double, of what it purchases. This makes a surplus available for urban dwellers. The column also shows the tremendous diversity of maize trading patterns across the zones where almost all households and zones are involved in both sales and purchases. But sales as a proportion of purchases are lowest in the Coastal lowlands, the Marginal Rain Shadow zone that suffered from two consecutive drought years, and the traditionally deficit Western Lowlands along the shores of Lake Victoria. The transitional and highland zones, and surprisingly, the eastern lowlands all sell about half of what they end up buying in the market later in the season mainly as grain but also as sifted maize meal. The Eastern lowlands are the fourth most important source of marketed maize after the HPMaize, Western transitional and Central Highland zones. This is shown in the second column of data. One region, the High Potential Maize Zone, accounts for 90.5% of marketed maize.

**Table 19. Regional Dis-aggregation Of National Maize Sales and Purchase Patterns**

Zone	Sales as % of Purchases	% of National Sales	Districts within High Potential Maize Zone		
			District	Purchases as % of Sales	% of National Sales
Northern Arid	16.25	0.19			
Coastal Lowlands	1.31	0.08			
Eastern Lowlands	43.70	2.29	Bungoma	29.07	4.92
Western Lowlands	5.43	0.37	Lugari (Kakamega)	1.67	16.60
Western Transitional	38.73	2.85	Bomet	280.25	0.47
High Potential Maize Zone	985.71	90.47	Nakuru	20.20	11.56
Western Highlands	37.51	1.15	Narok	4.58	6.54
Central Highlands	35.49	2.51	Trans Nzoia	7.14	29.43
Marginal Rain Shadow	1.83	0.09	Uasin Gishu	6.77	20.94
	195.73	100.00		10.14	90.47

The right-hand portion of Table 19 provides a breakdown of purchases as a percentage of sales for districts within the High Potential Maize Zone. Bomet households end up buying almost 3 times as much maize as they sell. All other zones engage in both purchases and sales that range from a low of less than 2% in Lugari where very small amounts of maize are bought from the market, to 20% and 29% in Nakuru and Bungoma respectively. Overall households in the HPMaize Zone buy 10 % as much maize as they sell.

Table 20 shows the absolute dominance of the HPMaize Zone in national maize sales. 90.5% of sales come from this zone with 4 districts, Trans-Nzoia, Uasin Gishu, Lugari and Nakuru accounting for almost 70% of the maize sold in the sample. The importance of this zone is also reflected in how closely who maize is sold to nationally reflects what is happening in the zone.

Table 20 also shows how different the pattern of maize marketing in the HPMaize Zone is from the rest of the country. Outside of the HPMaize Zone half of the maize sold is sold to private traders and 40% to local households. In the maize zone private traders (76%), millers and the NCPB are the main channels. Direct sales to NCPB account for only 9% of the maize sold in the maize zone and only 1% of the maize sold in the rest of the country. This reflects dramatic changes in national maize marketing patterns and that the NCPB is becoming a peripheral player in the national maize market in terms of direct dealings with farmers. Undoubtedly a number of the traders were delivering maize to the NCPB.

**Table 20. Who Maize Is Sold To**

	National	HpMZ	Remainder of country
Private Trader	73.59	76.01	50.68
Miller	10.49	11.52	0.74
NCPB	8.35	9.12	1.03
Local HH	6.04	2.43	40.28
Distant HH	0.74	0.26	5.21
Co-op	0.35	0.39	0.00
School	0.26	0.09	1.91
Pvt Firm	0.18	0.19	0.00
Workers	0.01	0.00	0.15

## 8. EQUITY

This paper has thus far concentrated on giving regionally-dis-aggregated measures of income, agricultural practices and assets, and market behavior – mostly factual data about the state of Kenyan agriculture. The paper has used standard economic measures to indicate where Kenya is in its quest for the sectoral policy goals of income growth, productivity growth, and food security. Equity, the fourth policy goal is very normative. This makes wide agreement about what can be used to measure it, difficult to reach.

Equity refers to some notion of equitable distribution. The analysis presented thus far indicates wide disparities across regions in all parameters suggesting that equity objectives has not been met. Table 21 shows the Central Highlands ranks first or second in 9 of the 10 categories that measure access to “development infrastructure.” The Northern Arid and marginal Rain Shadow zones rank last or second to last in 5 categories, the coastal lowlands in 4 and the Eastern and Western Lowlands in 3 of each. But the goal of policy may not be that all regions and households should be equal. Movement in that direction might be enough to say that the policy is being successfully pursued. Recognizing that natural endowments of soil, rainfall etc. play a part in determining some of the parameters presented, and that no similar survey exists

against which to measure progress, we present the data and suggest that progress toward equity can be measured against this baseline in the future. Kenya has among the highest Gini Coefficients in the world, suggesting that most of the wealth is in a few hands. Most of the wealthy are undoubtedly in the urban areas, but income disparities also exist among the rural zones, and among households in a given zone.

On most agricultural parameters presented thus far the High Potential Maize Zone and the Central Highlands appear to perform well whereas the Coastal, Eastern and Western Lowlands perform poorly. This pattern applies to household agricultural income, agricultural income per acre, the value of crop production and sales, crop and livestock income, receipt of credit, degree of commercialization, use of fertilizer, use of hybrid seed, livestock assets and sales, and total household assets. Those regions also are the most maize deficit and have the largest proportion of households that are net buyers of maize and have to make up for their lack of maize to meet daily calorie requirements from the market. If equity is about who is better and who is worse off, then the lowland zones represent a challenge for those pursuing the equity agenda.

Recent agricultural policy does not seem to be following such an agenda. Policy, through import bans, and tariffs is making net sellers better off, net buyers worse off. The majority of net sellers are in the relatively better off regions. The anti-import policy, even when the ban or tariffs are lifted still have the effect of raising prices above what they otherwise would be since private sector players cannot plan far ahead to import maize supplies. Reduced domestic supplies raise domestic prices. The policy is said to be protection for maize producers but actually harms 68% of rural households and only benefits the 17% of all households in the High Potential Maize Zone who produce 90% of marketed maize. Even within this zone 37% of households are negatively affected by import bans and tariffs on imports of the food of choice among a majority of Kenyans, urban as well as rural. Including urban households in the calculus of winners and losers from the import tariff policy makes it even more difficult to defend.

**Table 21. Access To Development Services and Infrastructure (Kilometres)**

ZONE	Electricity	Matatu	Motorable Road	Piped Water	Tarmac Road	Minutes walk to Health Center	Fertiliser Stockist	Telephone	Veterinary Services	Extension
Coastal Lowlands	4.08	3.25	1.53	8.73	8.76	25.80	31.03	5.18	9.51	9.76
Eastern Lowlands	10.73	3.07	1.47	13.74	16.05	59.70	10.61	6.70	5.10	5.49
Western Lowlands	4.15	2.34	2.01	7.86	6.05	66.33	15.51	3.79	6.12	6.65
Western Transitional	4.65	1.74	.52	6.84	7.57	32.50	6.73	6.17	4.91	5.68
HP Maize Zone	7.66	2.12	.90	10.16	8.14	55.94	5.19	7.68	4.94	5.30
Western Highlands	3.67	2.11	1.53	8.14	8.10	52.71	3.12	3.62	3.47	5.49
Central Highlands	1.53	1.63	.51	1.78	5.53	45.52	2.77	3.03	3.05	3.71
Marg. Rain Shadow	15.05	3.46	2.71	18.37	11.17	-	24.09	8.62	4.59	2.71

## 9. CONCLUSIONS

Agricultural policy in Kenya revolves around the goals of income growth, commercialization and intensification, food security and equity. These goals are widely accepted but little effort has been put into measuring progress toward them. This paper gives an introduction to an effort by Tegemeo to provide a baseline of information that can be used to do that.

Kenya exhibits a wide diversity in its agro-ecological endowments. This is partly responsible for the wide disparity in agricultural income across zones from both crop and livestock activities, at both the household and per acre level. A pattern emerges of relatively low agricultural incomes in the Western, Eastern and Coastal Lowlands, and relatively high incomes in the High Potential Maize and Central Highland zones. However households in the relatively poor agricultural zones have responded by having higher rates of participation in off-farm salaried employment and business activity, and receiving higher amounts of remittances, than households in the agriculturally better off zones. Efforts to improve the general economy will have benefits for agricultural households 50% of whom have a salaried member, 36% of which have a member involved in off-own farm business or labor activities, and 33% of whom receive remittances from family members living off the farm for most of the year.

Only 25% of crop production is sold in the whole country, and only in the maize zone is more than half (53%) sold. In the poorer zones less than 20% of crop production is for the market. Kenya has a long way to go to meet its commercialization objective, and although there is some evidence of changes in cropping patterns toward more market oriented production, low rates of fertilizer, improved seed and credit use will slow the process of commercialization, particularly in the poorer zones.

The liberalization of maize markets has generated a great deal of debate among policy analysts and in the media. Of rural households, 59% reported that they prefer the current marketing system as did 72% and 61% of those selling and buying maize respectively. In the maize zone, 90% of households found that selling maize was now easier and more convenient and a majority of households in the zone (60%) prefer the post liberalization maize market. Sixty-eight percent of the households around the country and 37% of households in the maize zone buy more maize than they sell. Most of rural Kenya prefers a liberalized market, but the majority of households stated that they are made worse off by policies that raise the level of maize prices. This message may have important implications for policies that affect maize prices such as the maize import tariff.

No one paper could go into all the detail available in the database. This one has limited itself to descriptive analysis of regional data to give a flavor of the types of analysis that can be undertaken using the database, a database we will continue to explore over the coming months. However this descriptive data is able to provide insights useful to Kenyan policy makers targeting income growth, commercialization, food security and equity in a resource constrained environment.

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